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ADHESIVE SOFT VINYL CHLORIDE BASE MATERIAL, ADHESIVE TAPE OR SHEET,  
AND THE MANUFACTURING METHOD

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ADHESIVE SOFT VINYL CHLORIDE BASE MATERIAL, ADHESIVE TAPE AND SHEET,  
AND THE MANUFACTURING METHOD

[Nensechakuyo nanshitsu enka vinyl kizai narabini nenchaku tape moshikuwa sheet oyobi sono  
seizo hoho]

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[There are no amendments to this patent.]

Claims

1. An adhesive soft vinyl chloride base material with the characteristic that it consists of a sheet or film that has a mixture of vinyl chloride resin, a plasticizer with a molecular weight below 500, and a metal-containing stabilizer.

2. An adhesive tape or sheet, which is an adhesive tape that has an adhesive agent layer on both surfaces of the base material, with the characteristic that said base material consists of a sheet or film that has a mixture of vinyl chloride resin, a plasticizer with a molecular weight below 500, and a metal-containing stabilizer, and an acrylic resin type of adhesive agent layer is formed at least on one side on the base material.

3. A manufacturing method of an adhesive tape or sheet with the characteristic that an acrylic resin type of adhesive agent layer is formed at least on one side of the vinyl chloride base material that has a mixture of a mixture of vinyl chloride resin, a plasticizer with a low molecular weight, and a metal-containing stabilizer, and a crosslinking reaction is created in the acrylic resin type adhesive agent by the stabilizer that contains the metal that is shifted together with the plasticizer by shifting the plasticizer to the adhesive agent layer over time.

4. A manufacturing method of an adhesive tape or sheet with the characteristic that an acrylic resin type adhesive agent layer is formed at least on one side of the vinyl chloride base material that has a mixture of a mixture of a vinyl chloride resin, a plasticizer with a low molecular weight, and a metal-containing stabilizer, and the anchoring effect between the base material and the plasticizer is improved by shifting the plasticizer to the adhesive agent layer over time.

#### Detailed explanation of the invention

[0001]

##### Industrial application field

The present invention concerns an adhesive soft vinyl chloride base material that has a mixture of a mixture of a vinyl chloride resin as the main component, as well as an adhesive tape or sheet that uses that base material, and its manufacturing method.

[0002]

##### Prior art

As conventional base materials for adhesive tapes, materials like polyvinyl chloride (PVC), polyethylene terephthalate (PET), and polypropylene (PP), for example, in sheet, film, paper, and nonwoven fabric, etc., have been generally used.

[0003]

When using polyvinyl chloride as the base material, a plasticizer, such as dioctyl phthalate (DOP), for example, is also added to the base material for giving flexibility to the base material.

[0004]

When using soft vinyl chloride that has a plasticizer added to the base material as the base material, a primer layer is generally formed prior to coating an adhesive agent onto the base material for preventing the plasticizer from shifting to the adhesive agent layer over time.

[0005]

In this case, the plasticizer is not included at all in the aforementioned various types of base materials, or its shift to the adhesive agent layer is prevented by the primer layer although the plasticizer is contained. There is an issue that the anchoring effect is not displayed by softening of the adhesive agent, and a specific initial adhesive strength cannot be obtained when the plasticizer does not shift from the base material to the adhesive agent layer.

[0006]

There also is an issue that a crosslinking reaction between the metallic component that is contained in the stabilizer and the functional group in the adhesive agent does not occur because the stabilizer does not shift to the adhesive agent layer together with the plasticizer, and a specific permanent adhesive strength cannot be obtained.

[0007]

Problem to be solved by the invention

The objective of the present invention, which is made in consideration of the aforementioned problems, is to offer an adhesive soft chloride base material and an adhesive tape with an excellent initial adhesive strength that display an excellent adhesive strength over a long period of time without decreasing in adhesive strength over time.

[0008]

Means to solve the problems

The present invention consists of 4 inventions. The adhesive soft vinyl chloride base material described in Claim 1 has the characteristic that it consists of a sheet or film that has a mixture of vinyl chloride resin, a plasticizer with a molecular weight below 500, and a metal-containing stabilizer.

[0009]

The adhesive tape or sheet described in Claim 2, which is an adhesive tape that has an adhesive agent layer on both surfaces of the base material, has the characteristic that said base material consists of a sheet or film that has a mixture of vinyl chloride resin, a plasticizer with a molecular weight below 500, and a metal-containing stabilizer, and an acrylic resin type of adhesive agent layer is formed at least on one side of the base material.

[0010]

The manufacturing method of an adhesive tape or sheet described in Claim 3 has the characteristic that an acrylic resin type of adhesive agent layer is formed at least on one side of the vinyl chloride base material that has a mixture of a mixture of a vinyl chloride resin, a plasticizer with a low molecular weight, and a metal-containing stabilizer, and a crosslinking reaction is formed in the acrylic resin-type adhesive agent by the stabilizer that contains the metal that is shifted together with the plasticizer by shifting the plasticizer to the adhesive agent layer over time.

[0011]

The manufacturing method of an adhesive tape or sheet described in Claim 4 has the characteristic that an acrylic resin type of adhesive agent layer is formed at least on one side of the vinyl chloride base material that has a mixture of a mixture of a vinyl chloride resin, a plasticizer with a low molecular weight, and a metal-containing stabilizer, and the anchoring effect between the base material and the plasticizer is improved by shifting the plasticizer to the adhesive agent layer over time.

[0012]

With the above, the aforementioned objective will be attained. The present invention will be explained in detail below. Vinyl chloride resin generally with an average polymerization degree of 800-1300 is desirably used of the present invention.

[0013]

The plasticizer used of the present invention also shifts to the adhesive agent layer and improves the initial adhesive strength immediately after lamination in addition to giving softness to the base material. The plasticizer also functions as a carrier for shifting the metal-containing stabilizer to the adhesive agent layer, and a long-term adhesive strength can be displayed when the metal in the stabilizer that has shifted to the adhesive agent layer crosslinks with the functional group in the acrylic resin-type adhesive.

[0014]

When the molecular weight of the plasticizer is large, it is difficult for the plasticizer that has shifted to the adhesive agent layer to transpire. One with a molecular weight below 500 is used because it will be difficult to obtain a sufficient initial adhesive strength and a long-term adhesion.

[0015]

Examples of the aforementioned plasticizer include dioctyl phthalate (DOP), dibutyl phthalate (DBP), dimethyl phthalate (DMP), diisodecyl phthalate (DIDP), and diaryl phthalate (DAP), for example.

[0016]

The shifting amount of the plasticizer to the adhesive agent layer becomes small when the mixing amount of the aforementioned plasticizer is small, which not only makes it difficult to obtain a sufficient initial adhesive strength, but the crosslinking reaction does not advance sufficiently due to a reduced shift amount of the stabilizer to the adhesive agent layer. The roll molding of the base material also becomes difficult when the mixing amount is large. Therefore, it is desirable for it to be in a range of 20-60 parts by weight for 100 parts by weight vinyl chloride resin.

[0017]

When the molecular weight of the aforementioned plasticizer is large, it is difficult for the plasticizer that has shifted to the adhesive agent layer to transpire, and it also prevents the obtaining of a sufficient initial adhesive strength and long-term adhesion. Therefore, one with a small molecular weight is desirable.

[0018]

However, the smaller the molecular weight of the plasticizer becomes, specifically, when the molecular weight is in a range of about 340-100, the plasticizer easily shifts to the adhesive agent layer in the normal temperature range, and it easily transpires from the adhesive agent layer to the outside air even after the shift, which has excellent points like the improvement of the initial adhesive strength by the anchoring effect to the base material and the stabilization of the adhesive strength afterwards. However, when the adhesive tape is exposed to a high temperature (70-100°C, for example) immediately after manufacturing, crosslinking advances rapidly near the interface between the base material and the adhesive agent layer, and hardening accelerates, which, as a result, does not sufficiently display the anchoring effect, and separation easily occurs at the interface.

[0019]

Accordingly, in cases with exposure to such environmental conditions, it is desirable to have the molecular weight in a range higher than the aforementioned, that is, about 340-500. By selecting one with such a molecular weight, crosslinking of the adhesive agent near the interface

of the base material can be delayed even at a high temperature, and, as a result, a sufficient anchoring effect is created, and initial adhesive strength can be obtained.

[0020]

High-grade fatty acid metallic salts are satisfactory as the stabilizer used of the present invention that contains a metal, and examples include calcium stearate, barium stearate, lead stearate, and zinc stearate, for example.

[0021]

The aforementioned stabilizer shifts to the adhesive agent layer together with the plasticizer, and the metal in the stabilizer that has shifted into the adhesive agent layer has a crosslinking reaction with the functional group in the acrylic resin-type adhesive, which improves the improvement of the adhesive strength.

[0022]

The desirable mixing amount of the aforementioned stabilizer is 3-20 parts by weight because the weather resistance decreases when it is low and the base material becomes brittle when it is high. As the adhesive agent that is used in the adhesive agent layer of the present invention, acrylic resin-type adhesives that have ester acrylate as the main component can be listed.

[0023]

The aforementioned acrylic resin type of adhesive agent layer may be formed at least on one side of the base material, and another adhesive agent layer other than the aforementioned may be formed on the other side. Release paper may also be laminated onto the surface of the adhesive agent layer as an adhesive sheet.

[0024]

Function

In the adhesive soft vinyl chloride base material and the adhesive tape of the present invention, it seems that the plasticizer in the base material shifts to the adhesive agent layer and also functions as a carrier that shifts the metal-containing stabilizer to the adhesive agent layer.

[0025]

In the adhesive tape of the present invention, the plasticizer that is in the base material shifts to the adhesive agent layer, which softens the adhesive agent in order to improve the

anchoring effect and helps to increase the initial adhesive strength of the adhesive agent. Furthermore, it is presumed that the stabilizer that has shifted has ion bonding or chelate bonding with the functional group in the adhesive agent when the metal-containing stabilizer shifts to the adhesive agent layer, which develops by a crosslinking reaction and improves the adhesive strength.

[0026]

The adhesive strength of the aforementioned adhesive agent improves when the plasticizer transpires from the adhesive agent layer. However, it is presumed that the aforementioned reaction advances gradually because of the presence of the metallic ions in the plasticizer, while offering stable adhesive strength for a long period of time without decreasing in adhesive strength over time.

[0027]

Application examples

The present invention will be explained in the application examples below.

#### 1) Preparation of double-sided adhesive tapes

Using as the base material, vinyl chloride resin sheets (thickness of 50  $\mu\text{m}$ ) that are prepared with 100 parts by weight vinyl chloride resin (average polymerization degree of 1,000) with different mixing amounts of various types of plasticizers and stabilizers that contain metals, as shown in Application Examples 1-7 in Table 1, an adhesive agent layer (dry thickness of 50  $\mu\text{m}$ ) of an acrylic resin-type adhesive agent ("SK dine-1717" manufactured by Soken Chemistry Co.) is formed on both sides of said base material by roll coater, and double-sided adhesive tapes are prepared.

[0028]

As comparison examples, vinyl chloride resin sheets (50  $\mu\text{m}$ ) in the compositions indicated in Comparison Examples 1-6 in Table 1 are also prepared using the same vinyl chloride resin used in the application examples, the adhesive agent layer is formed in the same manner as in the application examples, and double-sided adhesive tapes are prepared.

#### 2) Properties of the double-sided adhesive tapes

##### (1) Evaluation of the anchoring effect

One side of the prepared double-sided adhesive tape (size A4) is laminated onto a clear glass plate that is slightly larger than size A4, the adhesion circumstance is observed with the



naked eye from the back face of the glass plate, and the anchoring effect is evaluated in accordance with the following criterion for evaluation.

[0029]

When the entire adhesive agent layer of the double-sided adhesive tape

- (a) has adhesion of over 90% with the glass plate: ○
- (b) has adhesion of over 70% but less than 90% with the glass plate: ○
- (c) has adhesion of less than 70% with the glass plate: X

## (2) Gel content ratio

Using a pulp nonwoven fabric as the base material, an acrylic resin type of adhesive agent layer is formed on both sides of said base material in the same manner as in the application examples, and double-sided adhesive tapes are prepared.

[0030]

First, a specific size is cut off as a sample from the double-sided adhesive tape immediately after manufacturing, said sample is soaked in a tetrahydrofuran (THF) solution. The nonwoven fabric and the gelled adhesive agent remain as dissolved materials in the THF solution. The dissolved materials are measured after filtering and separating the dissolved materials, and the amount of the gel content of the adhesive agent layer is calculated by subtracting the weight of the nonwoven fabric (can be calculated from the tsubo weight) from the weight of the dissolved material.

[0031]

The weight of the adhesive agent layer can also be calculated by subtracting the weight of the nonwoven fabric from the weight of the sample, and the gel content ratio ( $G_0$ ) of the double-sided adhesive tape immediately after manufacturing is calculated from the weight of the gel content of the adhesive agent layer and the entire weight of the adhesive agent layer.

[0032]

Furthermore, a specific size is cut off as a sample from the double-sided adhesive tape that is left at 30°C and 120°C for 1 month after manufacturing, the gel content ratio ( $G_1$ ) of this sample is also calculated in the same aforementioned method. In the comparison of  $G_0$  and  $G_1$ , (a) it is O when  $G_1 > G_0$ , and (b) X when  $G_1 \leq G_0$ , and Table 1 shows the results

### (3) Residual plasticizer

After leaving the double-sided adhesive tapes prepared in Application Examples 1-4 and Comparison Examples 1-3 at 30°C and the double-sided adhesive tapes prepared in Application Examples 5-7 and Comparison Examples 4-6 at 120°C, respectively, for 1 month, the amount of the residual plasticizer in the adhesive agent layer is measured by the IR method. They are compared to the amount of the plasticizer in the double-sided adhesive tape immediately after manufacturing. When the amount of the residual plasticizer is less than 1 wt%, it is O, and it is X when it exceeds 1 wt %, and Table 1 shows the results.

### (4) Evaluation of the adhesion

The double-sided adhesive tapes in Application Examples 1-4 and Comparison Examples 1-3 immediately after manufacturing and left at 30°C for 1 month, and the double-sided adhesive tapes in Application Examples 5-7 and Comparison Examples 4-6 immediately after manufacturing and left at 120°C for 1 month are respectively compared. Examples with an increase in the gel content ratio and a decrease in the amount of the residual plasticizer to below 1 wt% are evaluated as "satisfactory" in the adhesion, and the rest are evaluated as "poor" adhesion, and Table 1 shows the results.

### [0033]

An acrylic resin type of adhesive agent layer is formed on both sides of the base materials in the compositions indicated in Table 1 as in the application examples, and double-sided adhesive tapes are prepared. Their anchoring effect is evaluated, and the gel content ratio and the amount of the residual plasticizer are measured in the same manner as in the application examples. Table 1 shows the measurement results and the evaluation results of the adhesion.

[0034]

Table 1

Note) ( ): molecular weight, polysizer W-305: polyester adipate type plasticizer (manufactured by Dai Nippon Ink Co.)

① (単位: 重量部)

		② 実 施 例							③ 比 較 例					
		1	2	3	4	5	6	7	1	2	3	4	5	6
配 可 製 剤	⑤ 塩化ビニル樹脂	100	100	100	100	100	100	100	100	100	100	100	100	100
	⑥ DBP (278)	40	—	—	50	—	—	—	85	—	—	—	—	—
	DMP (194)	—	30	—	—	—	—	—	—	—	—	—	—	—
	DAP (246)	—	—	35	—	—	—	—	—	—	—	—	—	—
	DOP (391)	—	—	—	—	—	—	50	—	40	30	—	—	—
	DHP (342)	—	—	—	—	30	—	—	—	—	—	65	—	—
	DIDP (447)	—	—	—	—	—	35	—	—	—	—	—	—	—
	ポリマー W-305 (2000以上) ⑦	—	—	—	—	—	—	—	—	—	—	—	40	30
	ステアリン酸バリウム ⑧	—	—	10	5	—	10	10	—	5	—	—	5	—
	ステアリン酸亜鉛 ⑩	—	1	10	5	2	10	10	1	5	—	1	5	—
合 成 金 属 塩	ステアリン酸カルシウム ⑪	—	2	—	—	3	—	—	1	—	—	1	—	—
	ステアリン酸鉛 ⑫	10	—	—	—	—	—	—	—	—	10	—	—	10
	⑬ 投 録 効 果 ⑭	○	○	○	◎	○	○	◎	○	○	◎	○	○	○
性	ゲル分率 ⑮	○	○	○	○	○	○	○	×	○	○	×	○	○
	殘留可塑剤 ⑯	無	無	無	無	無	無	無	有⑬	有⑮	無⑰	有⑱	有⑲	有⑳
	凝着性 ⑰	良好	良好	良好	良好	良好	良好	良好	不良	不良	不良	不良	不良	不良

注) ( ): 分子重、ポリサイザー W-305: アジピン酸ポリエステル系可塑剤 (大日本インキ社製)

- Key: 1 (Unit: parts by weight)  
 2 Application Examples  
 3 Comparison Examples  
 4 Composition  
 5 Vinyl chloride resin  
 6 Plasticizers  
 7 Polysizer W-305 (over 2000)  
 8 Fatty acid metallic salts  
 9 Barium stearate

10	Zinc stearate
11	Calcium stearate
12	Lead stearate
13	Properties
14	Anchoring effect
15	Gel content ratio
16	Residual plasticizer
17	No
18	Yes
19	Adhesion
20	Satisfactory
21	Poor

[0035]

#### Effect of the invention

With the adhesive soft vinyl chloride base material of the present invention, the initial adhesive strength and long-term adhesion of the adhesive agent are improved by shifting of the plasticizer contained by said base material to the adhesive agent layer.

[0036]

The adhesive tape of the present invention has an excellent initial adhesive strength, and its adhesive strength does not decrease with the passage of time, and it offers excellent adhesive strength over a long period of time.